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EXAMINER	
MEW, KEVIN D	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/783,792	Applicant(s) MISRA ET AL.	
	Examiner Kevin Mew	Art Unit 2664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 February 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,8,9,12-20 and 22-24* is/are rejected.

7)☒ Claim(s) *6-7, 10-11, 21, 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *2/15/2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2 & 5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: reference numerals 52 in Fig. 4. Corrected drawing sheets, or amendment to the specification to add the reference character(s) in the description, are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference character(s) mentioned in the description:

element 74_1 in line 2 of page 9. Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claims 1, 4-5, 8-9, 18-20, 22-24** are rejected under 35 U.S.C. 102(e) as being anticipated by the admitted prior art, Laakso et al. (USP 5,933,423).

Regarding claim 1, Laakso discloses a method for use in receiving a plurality of data signals transmitted over a shared spectrum (**all the terminal equipment transmit at the same frequency to the base station**, see lines 39-43, col. 3) in a time slot in a time division (**received signals are divided into several groups such that the signals in**

each group are detected from the received transmission simultaneously, see lines 60-63, col. 2) duplex communication system (**signals transmitted and received at both mobile stations and base stations**, see Fig. 1) using code division multiple access (**CDMA cellular radio network**, see line 35, col. 3), the method comprising:

receiving a combined signal over the shared spectrum in the time slot (**all the terminal equipment transmits at the same frequency to the base station, which distinguishes the transmissions of the different terminal equipment from one another on the basis of the spreading codes of the terminal equipment**, see lines 42-46, col. 3);

grouping the plurality of data signals into a plurality of groups (**received signals are divided into groups, each group comprising at least two different signals**, see lines 53-55, col. 3);

match filtering the combined signal based on in part symbol responses associated with the data signals of one of the groups (**filters matched with the spreading codes of the signals to be detected**, see lines 1-2, col. 6);

jointly detecting data from each data signal in the one group (**within a group, the signals are detected from the received transmission simultaneously by a detection algorithm provided by simultaneous multiuser detection**, see lines 55-59, col. 3);

constructing an interference signal based on in part the one group detected data (**after the detection, the signals are regenerated for interference cancellation**, see lines 46-49, col. 5);

subtracting the constructed interference signal from the combined signal (**the output of the regenerating means is extracted from the adder so that the**

interference of the signals belonging to the first group with the other signals is eliminated, see lines 50-53, col. 5); and

determining data from a group other than the one group by processing the subtracted signal (**the detector block comprises means for simultaneous detection of the signals in the second group**, see lines 54-56, col. 5 and Fig. 3).

Regarding claim 4, Laakso discloses a method for use in receiving a plurality of data signals transmitted over a shared spectrum (**all the terminal equipment transmit at the same frequency to the base station**, see lines 39-43, col. 3) in a time slot in a time division (**received signals are divided into several groups such that the signals in each group are detected from the received transmission simultaneously**, see lines 60-63, col. 2) duplex communication system (**signals transmitted and received at both mobile stations and base stations**, see Fig. 1) using code division multiple access (**CDMA cellular radio network**, see line 35, col. 3), the method comprising:

(a) receiving a combined signal as an input signal over the shared spectrum in the time slot (**all the terminal equipment transmits at the same frequency to the base station, which distinguishes the transmissions of the different terminal equipment from one another on the basis of the spreading codes of the terminal equipment**, see lines 42-46, col. 3);

(b) grouping the plurality of data signals into a plurality of groups, at least one of the groups having a plurality of data signals (**received signals are divided into groups, each group comprising at least two different signal**, see lines 53-55, col. 3);

(c) match filtering the input signal based on in part symbol responses associated with each data signal of a first group of the groups (**filters matched with the spreading codes of the signals to be detected**, see lines 1-2, col. 6);

(d) jointly detecting data from each data signal in the first group (**within a group, the signals are detected from the received transmission simultaneously by a detection algorithm provided by simultaneous multiuser detection**, see lines 55-59, col. 3);

(e) constructing an interference signal based on in part the first group detected data (**after the detection, the signals are regenerated for interference cancellation**, see lines 46-49, col. 5);

(f) subtracting the constructed interference signal from the input signal as an input signal for subsequent processing (**the output of the regenerating means is extracted from the adder so that the interference of the signals belonging to the first group with the other signals is eliminated**, see lines 50-53, col. 5)

(g) match filtering the subtracted signal based on in part symbol responses associated with the data signal of a subsequent group of the groups (**the detector means 35, containing a match filter and receiving the subtracted signal from adder 34**, see lines 66-67, col. 5 and lines 1-2, col. 6 and Fig. 3)

(h) jointly detecting data from each data signal in the subsequent group (**the detector means 35 comprises means for simultaneous detection of the signals of the second group**, see lines 54-55, col. 5) and

(i) successively repeating steps (e) through (h) for remaining groups of the plurality of groups where, for each remaining group, the subsequent group acts as the first

group for that remaining group and that remaining group acts as the subsequent group (**the same procedure is continued, proceeding to the weakest group, until all the groups and signals have been detected**, see lines 35-45, col. 4, lines 56, 65, col. 5, and Fig. 3).

Regarding claim 5, Laakso discloses a method for use in a receiver for receiving a plurality of data signals transmitted over a shared spectrum (**all the terminal equipment transmit at the same frequency to the base station**, see lines 39-43, col. 3) in a time slot in a time division (**received signals are divided into several groups such that the signals in each group are detected from the received transmission simultaneously**, see lines 60-63, col. 2) duplex communication system (**signals transmitted and received at both mobile stations and base stations**, see Fig. 1) using code division multiple access (**CDMA cellular radio network**, see line 35, col. 3), the method comprising:

receiving a combined signal over the shared spectrum in the time slot (**all the terminal equipment transmits at the same frequency to the base station, which distinguishes the transmissions of the different terminal equipment from one another on the basis of the spreading codes of the terminal equipment**, see lines 42-46, col. 3);

estimating a received power level for each data signal (**each group comprises signals received at approximately the same power**, see lines 63-65, col. 3);

selectively grouping data signals of the plurality of data signals based on in part the received power level of the data signals into at least one group (**the signals are**

divided into groups on the basis of preliminary power measurement of the received signal, see lines 59-65, col. 3); and

separately detecting data within each group for that group's data signals (**within a group, the signals are detected from the received transmission simultaneously by a detection algorithm provided by simultaneous multiuser detection**, see lines 55-58, col. 3).

Regarding claim 8, Laakso discloses the method of claim 5 wherein the estimating the received power level for each data signal is performed using a bank of matched filters, each matched filter matched to a code of a respective one of the data signals (see lines 66-67, col. 5 and lines 1-9, col. 6).

Regarding claim 9, Laakso discloses the method of claim 5 wherein the selectively grouping data signals groups data signals within a certain threshold power level into a group (see lines 59-65, col. 3).

Regarding claim 18, Laakso discloses a receiver (see lines 18-20, col. 3 and Fig. 3) for use in a time division (**received signals are divided into several groups such that the signals in each group are detected from the received transmission simultaneously**, see lines 60-63, col. 2) duplex communication system (**signals transmitted and received at both mobile stations and base stations**, see Fig. 1) using code division multiple access (**CDMA cellular radio network**, see line 35, col. 3), the

system communicating using multiple communication bursts in a time slot (see lines 60-63, col. 2), the receiver comprising:

an antenna for receiving radio frequency signals including the multiple communication bursts (**CDMA receiver at the base station receives signals transmitted at the same frequency from all the terminal equipment**, see element 20, Fig. 2);

a demodulator for demodulating radio frequency signals to produce a baseband signal (it is inherent that a demodulator at a CDMA receiver is used to demodulate radio frequency signals);

a channel estimation device for estimating a channel response for the bursts (**matched filter**, see lines 66-67, col. 5, lines 1-2, col. 6);

a successive interference cancellation joint detection (SIC-JD) device (see lines 18-20, col. 3 and Fig. 3) comprising:

a first joint detection block for detecting data within the baseband signal for a first group of bursts of the multiple bursts (**first detector means for simultaneous detection of the signals belonging to the first group**, see lines 44-49, col. 5 and element 30, Fig. 3);

a first interference construction block for constructing an estimate of interference of the first group bursts (**detected signals are sent to means 31 where the detected signals are regenerated for interference cancellation**, see element 31, Fig. 3);

a subtractor for subtracting the first group interference from the baseband signal (**the output of the regenerating means is extracted from the adder so that the**

interference of the signals belonging to the first group is eliminated, see lines 50-53, col. 5 and Fig. 3); and

a second joint detection block for detecting data within the subtracted signal for a second group of bursts of the multiple bursts (**second detector means for simultaneous detection of the signals of the second group**, see lines 56-60, col. 5 and element 35, Fig. 3).

Regarding claim 19, Laakso discloses the receiver of claim 18 wherein the SIC-JD device further comprises:

a plurality of additional joint detection blocks for detecting data for additional groups of bursts of the multiple bursts (see detector means 30, 35, 40, Fig. 3).

Regarding claim 20, Laakso discloses the receiver of claim 18 wherein the SIC-JD device further comprises:

a first matched filter for processing the baseband signal to match symbol responses of the data signals in the first group (**matched filter in detector means 30 matches with the spreading codes of the signals to be detected**, see lines 44-67, col. 5, lines 1-2, col. 6 and Fig. 3); and

a second matched filter for processing the subtracted signal to match symbol responses of the data signals in the second group (**detector means 35, comprising a second match filter, for matching with the spreading codes of the signals to be detected in the second group**, see lines 44-67, col. 5, lines 1-2, col. 6 and Fig. 3).

Regarding claim 22, Laakso discloses a device for use in a receiver of a time division (**received signals are divided into several groups such that the signals in each group are detected from the received transmission simultaneously**, see lines 60-63, col. 2) duplex communication system (**signals transmitted and received at both mobile stations and base stations**, see Fig. 1) using code division multiple access (**CDMA cellular radio network**, see line 35, col. 3), the system communicating using multiple communication bursts in a time slot (see lines 60-63, col. 2), the device comprising:

an input configured to receive a baseband signal associated with received bursts within a time slot (see input going into detector block, see element 25, Fig. 2);

a first joint detection block for detecting data within the baseband signal for a first group of bursts of the received bursts (**first detector means for simultaneous detection of the signals belonging to the first group**, see lines 44-49, col. 5 and element 30, Fig. 3);

a first interference construction block for constructing an estimate of interference of the first group bursts (**detected signals are sent to means 31 where the detected signals are regenerated for interference cancellation**, see element 31, Fig. 3);

a subtractor for subtracting the first group interference from the baseband signal (**the output of the regenerating means is extracted from the adder so that the interference of the signals belonging to the first group is eliminated**, see lines 50-53, col. 5 and Fig. 3); and

a second joint detection block for detecting data within the subtracted signal for a

second group of bursts of the received bursts (**second detector means for simultaneous detection of the signals of the second group**, see lines 56-60, col. 5 and element 35, Fig. 3).

Regarding claim 23, Laakso discloses the device of claim 22 further comprising additional joint detection blocks for detecting data for additional groups of bursts of the multiple bursts (see detector blocks 30, 35, 40, Fig. 3).

Regarding claim 24, Laakso discloses the device of claim 22 further comprising:

a first matched filter for processing the baseband signal to match symbol responses of the received bursts of the first group (**matched filter in detector means 30 matches with the spreading codes of the signals to be detected**, see lines 44-67, col. 5, lines 1-2, col. 6 and Fig. 3); and

a second matched filter for processing the subtracted signal to match symbol responses of the received bursts of the second group (**detector means 35, comprising a second match filter, for matching with the spreading codes of the signals to be detected in the second group**, see lines 44-67, col. 5, lines 1-2, col. 6 and Fig. 3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Laakso in view of De Gaudenzi et al. (USP 6,466,566).

Regarding claim 2, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 1 above, except fails to disclose the method of claim 1 wherein the jointly detecting is performed using least squares estimation. However, De Gaudenzi discloses a CDMA receiver (see lines 1-3, col. 1) to cancel multiuser interferences in a communication channel (see lines 18-19, col. 6) by using an adaptation algorithm Recursive Least Square detector (see lines 46-50, col. 7). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso with that of De Gaudenzi such that the detector means is using Recursive Least Squares algorithm such as the Recursive Least Squares Algorithm taught by Laakso. The motivation to do so is to enhance speed convergence because an improved performance would be achieved using the Recursive Least Squares algorithm.

6. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Laakso in view of Kim et al. (USP 6,570,863).

Regarding claim 3, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 1 above, except fails to disclose the method of claim 1 wherein the jointly detecting is performed using minimum mean square error estimation.

However, Kim discloses an apparatus and method for adaptive CDMA detection based on constrained minimum mean square error criterion (see lines 9-13, col. 1 and lines 3-7, col. 2). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso with that of Kim such that the detector means is using constrained minimum mean square error criterion as an adaptive algorithm for detecting a receiving signal in CDMA system such as the constrained minimum mean square error criterion by Kim. The motivation to do so is to control a tap weight of an adaptive filter so that it operates normally and does not converge to zero even if a phase and amplitude of an channel at the same time because an improved performance at the detector means would then be realized in a fading channel environment.

7. **Claims 12-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Laakso.

Regarding claim 12, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 5 above, except fails to explicitly show the method of claim 5 further comprising forcing all of the data signals into a single group to override the step of selectively grouping. However, it is well known in the art teaching that as the number of groups is decreased to just one, the signal interference cancellation required in the detector means is decreased as well. As a result, the performance of the detector block will improve as signal interference cancellation has been reduced. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that all

of the data signals would be grouped into just one single group to override the step of selective grouping. The motivation to do so is to reduce the interference cancellation required in the detection process to a minimum possible because the signal to noise ratio performance will increase in the absence of excessive interference cancellation.

Regarding claim 13, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 5 above, except fails to explicitly show the method of claim 5 further comprising forcibly grouping each data signal into its own group to override the step of selectively grouping. However, Laasko teaches that calculations needed in the detection of the received transmission are reduced significantly if the number of groups of signals is increased (see the exemplary calculations shown in lines 12-18, col. 5). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that each data signal would be grouped into its own group to override the step of selective grouping. The motivation to do so is to increase the number of groups to a maximum possible so that the calculations needed in the detection of the received transmission will be reduced significantly because having less complex circuit to perform calculations would reduce the complexity of the receiver.

Regarding claim 14, Laakso discloses a method for use in a receiver for adjusting a trade-off between complexity and performance in detecting data from data signals transmitted over a shared spectrum in a time slot in a time division duplex communication system using code division multiple access, the method comprising:

grouping the data signals into at least one group (**signals are divided into groups**, see lines 59-65, col. 3); and

jointly detecting data in each group (**within a group, the signals are detected from the received transmission simultaneously by a detection algorithm provided by simultaneous multiuser detection**, see lines 55-59, col. 3 and Fig. 3).

Laakso does not explicitly show to reduce the complexity, increasing a number of data signal groups.

However, Laasko teaches that calculations needed in the detection of the received transmission are reduced significantly if the number of groups of signals is increased (see the exemplary calculations shown in lines 12-18, col. 5). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that each data signal would be grouped into its own group to override the step of selective grouping. The motivation to do so is to increase the number of groups to a maximum possible so that the calculations needed in the detection of the received transmission will be reduced significantly because having less complex circuit to perform calculations would reduce the complexity of the receiver.

Laakso does not explicitly show to increase the performance, decreasing a number of data signal groups.

However, it is well known in the art teaching that as the number of groups is decreased to just one, the signal interference cancellation required in the detector means is decreased as well. As a result, the performance of the detector block will improve as signal interference cancellation has been reduced. Therefore, it would have been obvious

to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that all of the data signals would be grouped into just one single group to override the step of selective grouping. The motivation to do so is to reduce the interference cancellation required in the detection process to a minimum possible because the signal to noise ratio performance will increase in the absence of excessive interference cancellation.

Regarding claim 15, Laakso discloses the method of claim 14 further comprising:

determining a received power of each data signal (signals are divided into groups on the basis of preliminary power measurement of the received signal, see lines 59-65, col. 3);

the grouping is performed so that all data signals within each group are within a certain threshold power level (signals received at the highest power are placed in one group and signals received at lower powers are placed in other groups, see lines 61-65, col. 3).

Laakso does not explicitly show to reduce complexity, the certain threshold is increased. However, Laasko teaches that calculations needed in the detection of the received transmission are reduced significantly if the number of groups of signals is increased (see the exemplary calculations shown in lines 12-18, col. 5). It is also well known in the art teaching that as the threshold power level is increased, the number of groups of data signals that can be accommodated will increase accordingly. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso

such that the threshold power level of each group increases. The motivation to do so is to increase the number of groups to a maximum possible so that the calculations needed in the detection of the received transmission will be reduced significantly because having less complex circuit to perform calculations would reduce the complexity of the receiver.

Laakso does not explicitly show to increase performance, the certain threshold is reduced. However, it is well known in the art teaching that as the number of groups is decreased to just one, the signal interference cancellation required in the detector means is decreased as well. It is also well known in the art teaching that as the threshold power level is decreased, the number of groups of data signals that can be accommodated will decrease accordingly. As a result, the performance of the detector block will improve as signal interference cancellation has been reduced. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that threshold power level of each group decreases. The motivation to do so is to reduce the interference cancellation required in the detection process to a minimum possible because the signal to noise ratio performance will increase in the absence of excessive interference cancellation.

Regarding claim 16, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 14 above, except fails to explicitly show the method of claim 14 wherein to reduce the complexity, each group contains one of the data signals. However, Laasko teaches that calculations needed in the detection of the

received transmission are reduced significantly if the number of groups of signals is increased (see the exemplary calculations shown in lines 12-18, col. 5). Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that each group contains just one of the data signals. The motivation to do so is to increase the number of groups to a maximum possible so that the calculations needed in the detection of the received transmission will be reduced significantly because having a less complex circuit to perform calculations would reduce the complexity of the receiver.

Regarding claim 17, Laakso discloses all the aspects of the claimed invention set forth in the rejection of claim 14 above, except fails to explicitly show the method of claim 14 wherein to increase the performance, the at least one group is a single group. However, it is well known in the art teaching that as the number of groups is decreased to just one, the signal interference cancellation required in the detector means is decreased as well. As a result, the performance of the detector block will improve as signal interference cancellation has been reduced. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to modify the multiuser signal detection method and receiving means of Laakso such that all of the data signals would be grouped into just one single group. The motivation to do so is to reduce the interference cancellation required in the detection process to a minimum possible because the signal to noise ratio performance will increase in the absence of excessive interference cancellation.

Allowable Subject Matter

8. Claims 6, 7, 10, 11, 21, 25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In claim 6, the method of claim 5 wherein the estimating the received power level for each data signal is based on in part a prior knowledge at the receiver.

In claim 7, the method of claim 5 wherein the estimating the received power level for each data signal is based on in part a power level of a training sequence associated with each data signal.

In claim 10, the method of claim 9 wherein the certain threshold power level is one decibel.

In claim 11, the method of claim 9 wherein the certain threshold is adjusted to achieve a desired bit error rate at the receiver.

In claim 21, the receiver of claim 18 wherein an output of the first and second joint detection blocks are soft symbols, the SIC-JD device further comprising a first and second soft to hard decision block for converting the first and second joint detection block outputs into hard symbols.

In claim 25, the device of claim 22 wherein an output of the first and second joint detection blocks are soft symbols, the device further comprising a first and second soft to hard decision block converting the first and second joint detection block outputs into hard symbols.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure with respect to multi-user detection an adaptive combination of joint detection and successive interference cancellation.

US Patent 6,665,334 to Wichman et al.

US Patent 6,301,293 to Huang et al.

US Patent 6,240,099 to Lim et al.

US Patent 6,088,324 to Sato

US Patent 5,790,549 to Dent

US Patent 5,646,964 to Ushirokawa et al.

US Publication 2001/0026578 to Ando

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Mew whose telephone number is 703-305-5300. The examiner can normally be reached on 9:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wellington Chin can be reached on 703-305-4366. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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